GLONASS UNION

SCHOOL BUS

SAFEBUS for SCHOOL

Fleet management & surveillance solution for student transportation



NON-COMMERCIAL PARTNERSHIP FOR DEVELOPMENT AND USE OF NAVIGATION TECHNOLOGIES (GLONASS UNION)

GLONASS UNION OBJECTIVES:

- supporting legislative development in the field of navigation activities;
- developing a common technology policy for navigation sector;
- uniting the efforts and combining the resources of public and private sectors for development and adoption of navigation products and services that use satellite navigation technologies in Russia and abroad;
- forming a global ecosystem of developers and service and content providers that utilize satellite navigation technology.

INTERNATIONAL COOPERATION

- Navigation market in all of its segments (chipsets, equipment, systems, solutions, and services) and application areas (vehicles, smartphones, transportation, aviation, marine navigation, geodesy, construction, agriculture, and others) has no national borders.
- Russian navigation companies offer significant competitive advantages of telematics solutions for many foreign markets (MIDDLE EAST, LATIN AMERICA, EURASIAN ECONOMIC COMMUNITY).
- Building of major navigation information systems in transportation, based on satellite navigation technology and innovative Russian solutions, tested and proven in creating of the ERA-GLONASS System is a basis for a rapid, large-scale advancement of satellite navigation technology on world market.

UNION MEMBERS:

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JSC "MTS", JSC "VimpelCom", JSC "MegaFon" JSC "RTComm.ru" (Rostelecom), JSC "Yandex", JSC "Navigation Information Systems", GLONASS/GNSS Forum, Summa Telecom LTD, Transas Group, GC "Cesar Satellite", FSUE "ZaschitalnfoTrans", JSC "Control Systems"

THE GOAL:

COMPETITIVE RUSSIAN NAVIGATION INFORMATION SERVICES DEVELOPMENT SUPPORT





SAFETY ISSUES IN STUDENTS TRANSPORTATION



SAFEBUS for School is an integrated comprehensive solution based on innovative telecommunication and navigation technologies for fleet management, dispatching with schools and police department, audio/video surveillance, students identification, parents informing and other features.



SAFEBUS for SCHOOL

Complete fleet & security management solution for safe student transportation



The *SAFEBUS for SCHOOL* solution was tested within the School Transportation Management System in Moscow Region from 2012 to 2015. It had proved it's efficiency by high satisfaction of government officials and parents and will be implemented for all school buses in Russian Federation by the end of 2016.

- Real-time Tracking & Management
- Online Video & Audio surveillance
- Sensor safety monitoring
- Wireless student identification & positioning
- Instant notifications for parents & supervisors
- Mobile Data Collection
- Wireless Data Off-Loading & synchronization
- Mobile Wi-Fi access point



Typical school bus equipping

SOLUTION OVERVIEW: hardware layout





SOLUTION OVERVIEW: hardware layout



Typical school bus equipping

- 1. External camera to capture the overtaking cars
- 2. Internal front camera for salon monitoring
- 3. Internal rear camera for salon monitoring
- 4. Microphones for audio surveillance and recording
- 5. Smoke/temperature sensors along the salon for fire prevention and alarm notifications
- 6. Motion sensors to check students left behind or unauthorized access in depot
- 7. Engine operation sensors for vehicle condition and driver's behavior monitoring
- 8. Fuel-level sensor for drain prevention
- 9. Alarm button in cabin for a driver
- 10. Alarm buttons in salon for students

Alarm button



SOLUTION OVERVIEW: main features



Monitoring

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Comprehensive fleet monitoring and real-time parameters control: location, speed, direction, mileage, trip history, condition. Alert and notification subsystem with various methods of messages transferring.

Planning

Long-term (3 months), short-term (1 day) and operational planning.

Operational management

Operational management and real-time dispatching according to current situation for implementing of the entire fleet performance program. Faults reporting, logging and automatic backup. Route adjustment in case of critical failures.

Control

Transportation performance control: routes and schedules fulfillment, discipline compliance, safety provision. Driver authentication and access rights management.

Analysis

Analytical data acquiring and processing automation. Various custom reports generating according to special requirements.

Accounting



Automated data collecting and storing about particular vehicle or a group for specified time periods. Classifications, regulatory and reference information of enterprise. Trips on routes accounting.



SOLUTION OVERVIEW: benefits



- Compliance to the Police Department requirements
- Vandalism, bulling and discipline violation prevention
- Student transportation safety improvement
- Drivers and supervisors labor duty compliance control
- Accidents investigation facilitation
- Modular architecture to allow further scaling and performance increasing

The system provides a wide range of innovative tools for comprehensive school bus fleet management and safety provision

- Safety risks and operational cost reduction
- Remote access to every connected bus for real-time audio/video surveillance and diagnostics
- Integration with Police Department and Emergency Services for instant response in case of accidents
- SMS/mobile app notifications of bus arrival or student entry for parents and supervisors
- Real-time fleet location monitoring
- Online routes and schedules management
- Custom reports and comprehensive analysis tools



SOLUTION OVERVIEW: architecture



School Bus Fleet Management cloud solution provides centralized data management

- Every school bus sends on-line route and positioning information to the central telematics platform
- WEB-based FlagmanWEB® cloud solution supplies management interface for each user of the system
- Each school controls their own bus fleet only
- Police department controls every bus connected to the system



TRACKING & MANAGEMENT: hardware



Telematics terminal

ST Liner102 is a modern and effective onboard device designed to gain and transmit through GSM channels all information about the vehicle including current location, different sensor readings, onboard equipment condition, alarms, events, logs etc. The terminal allows establishing a voice communication between driver and dispatchers through built-in Bluetooth adapter.

GNSS signal receiver	GLONASS/GPS
Transmission protocol support	TCP/IP, UDP
Data transmission interval, sec	>1
GSM frequency, MHz	850, 900, 1800, 1900
Positioning accuracy, m	3 - 5
Number of SIM-cards	1
Internal events log capacity	20 000
Internal logging data types	Date/time, location, speed, acceleration, braking, maneuvers, alarm/event ID, I/O conditions etc.
Interfaces	RS-485, CAN 2.0, mini-USB
Internal sensors	G-Sensor, t∘
Operation temperature range, °C	From -40 to +85
Environment protection class	IP54
Power supply range, V	5,5 - 58
Dimensions, L x W x H, mm	120 x 140 x 40
Weight, kg	0,3



TRACKING & MANAGEMENT: hardware

Smoke/fire sensors

Smoke/fire sensor is an advance solution to provide a new level of safety inside the vehicle. The sensor can interact with a fire siren and has a feature to activate a fire extinguishing system.



Motion sensors



Motion sensors could be mounted in every bus to prevent leaving a passenger behind or entry of any unauthorized person into the bus when it stays locked in a depot. The IR technology allows to detect any movement inside the bus with a single sensor regardless of lighting conditions.

Alarm buttons

Every bus could be equipped with five alarm buttons: one for a driver and four for passengers. The button remains pressed until a security manager release it with the special key. All the alarm buttons could be active even if the bus stays parked in a depot.



Temperature sensors



Temperature sensors are required to monitor temperature conditions and prevent possible health hazards inside the bus. Constantly active temperature sensor prevents bus interior overheating by sending of special notification to an operator.



TRACKING & MANAGEMENT: hardware



A set of high quality precise digital sensors provide high safety level and detailed information regarding vehicle condition to reduce breakdowns and premature failures



TRACKING & MANAGEMENT: software







 Driver identification and behavior control speed, acceleration, braking and maneuvers





TRACKING & MANAGEMENT: software

Statistics, analytics and reports custom individual and group reports

Vehicle Status	Start Time	End Time	Interval (hh:mm:ss)	Distance (Km)	Average Speed (Kmph)	Start Location	End Location	Fuel Level
	2014-06-03 10:48:37	2014-06-03 10:49:17	00:00:40	0.00	0.00	Vaidik Library, Old Rajen	Vaidik Library, Old Rajen	50
\odot	2014-06-03 10:49:18	2014-06-03 10:49:47	00:00:29	0.13	15.77	Vaidik Library, Old Rajen	Vaidik Library, Old Rajen	50
0	2014-06-03 10:49:48	2014-06-03 10:50:57	00:01:09	0.00	0.00	Vaidik Library, Old Rajen	Vaidik Library, Old Rajen	50
\odot	2014-06-03 10:50:58	2014-06-03 10:53:27	00:02:29	1.16	28.04	Vaidik Library, Old Rajen	Balraj Khanna Marg, East	50
0	2014-06-03 10:53:28	2014-06-03 10:53:57	00:00:29	0.00	0.00	Balraj Khanna Marg, East	Balraj Khanna Marg, East	50
\odot	2014-06-03 10:53:58	2014-06-03 10:56:27	00:02:29	0.76	18.29	Balraj Khanna Marg, East	Shadipur,Red Light, New D	50
0	2014-06-03 10:56:28	2014-06-03 10:57:47	00:01:19 \//	orking k	noure nla	nning and control		

forking hours planning and contro

- Schedule conflicts control
- Bus arriving notifications via SMS and/or mobile application
- Emergency situations detection and vehicle conditions control
- Road traffic information available upon integration with Traffic Management System
- Collecting data for Traffic Management System



VIDEO SURVEILLANCE: hardware

Mobile DVR

The present model of MDVR proved to be excellent in such large and complex projects as ITS Moscow and Sochi Olympic Games 2014. This model was used in tens of thousands buses over the Russia and other countries.



Video cameras

A set of vandal resistant multidirectional color HD cameras with infrared backlight for internal and external video surveillance.



Driver's display

The driver's 7" video monitor provides high-quality and flawless video image in real-time mode from all cameras onboard when the bus stays on stops. The driver can select the picture mode depends on situation: 4-in-1, 2-in-1, one big image, zoomed image etc. This monitor is designed especially for automotive purposes.



- 8 Channels of video and audio recording (240fps@D1/2CIF/CIF)
- Molex connectors for shock and vibration resistance
- Removable hard disk
- 3.5" SATA HDD (up to 2TB) and 2.5" SATA HDD (up to 1TB) support
- 3xUSB, RS-485, RS-232, GPS port, wired Ethernet, IR Remote Control
- External 3G/WI-FI Modules for cellular / wireless transmission
- One external camera looking directly forward;
- One external camera looking directly backward;
- One external camera looking at the bus entrance;
- One external camera looking backward along the full length of the bus on driver's side;
- Two internal cameras looking at all seats in opposite directions.

Backup battery bank



The backup battery system provides uninterrupted power supply for all the system equipment onboard for at least 24 hours. The installation of battery bank in special cases protects it from the unauthorized access but allows proper ventilation.



VIDEO SURVEILLANCE: software

Surveillance software

- Authorized remote online access to video and audio data stored onboard;
- Automatic uploading video data to the servers by 3G/4G or Wi-Fi;
- Storing video archives in protected distributed database;
- User-friendly web interfaces & mobile apps for viewing online and stored video;
- Search engine to find a particular video fragment using various parameters (map based, date/time, location, bus number, street address, action/event, alarm or condition etc.).





- Incorporate any kind of texts and tags (location, date/time/alarms/events etc.) in all recorded video;
- Remote diagnostic of video surveillance equipment;
- Providing video data for integration with external systems (e.g. Police Departments) through special ActiveX components.

HARDWARE PROTECTION AND DATA SECURITY





Protection cases

All the equipment onboard must be installed in special protective cases to avoid unauthorized access, tampering, vandalism and other malicious actions. The cases are equipped with locks and can be opened only with special keys.

Hard drives removing protection

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All the onboard DVRs are equipped with hard drive removing protection system. Each hard drive tray is closed with a special door which can be locked by a key to prevent an unauthorized removing of a hard drive from a DVR. In addition that locks cut off the power of the hard drive while the tray door is opened.

Video data security

The data from a video surveillance system stored in hard drives is encrypted. It is not possible to read the video data or to convert the data to another video format without using of a special application included in the provided software pack. This application requires user authentication to prevent any unauthorized access to the data stored in removed hard drives.



OPTIONAL SYSTEM FEATURES









Student identification & positioning systems

The student identification & positioning system designed to control an absence or presence of student inside the bus. Students can use special wristbands, tags or smartphones as IDs when they pass through the bus entrance. The authorized users will have actual information about location of every student. The identification system will allow creating personal schedules for each student and send alarms if the schedule is not complied for some reason.

The identification system can be based on different technologies – RFID, NFC or iBeacon. The further development of this system will allow controlling the presence of students not only in school buses, but also in classrooms and other school quarters to provide continuous student monitoring for higher safety level.

Wi-Fi based internet access inside the bus

The system can be integrated with onboard Wi-Fi access point for students. It may be interconnected with the internal educational portal of a school. Students can do their homework while traveling, make collaborative projects, download required information and get audio/video educational data.



OPTIONAL SYSTEM FEATURES



Mobile Data Collection system

The Mobile Data Collection system is a special group of minivans which are designed to get, store and process video data from any school bus as well as to collect and carry removed hard drives.

All the tracking information from school buses is available for each minivan, so they can track a particular school bus and remove the hard drive with video data from DVR if needed.

The minivans are equipped with a special computer and telecom hardware which allows reading, copying, converting and transmitting the video data from hard drives to school and police department servers.

Each minivan should also be equipped with tracking devices and alarm buttons.

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